1. (10 points) Define a procedure \texttt{(substitute-queue! \textit{queue item})} that replaces the first element of \textit{queue} with \textit{item}.

2. (35 points) Write a procedure \texttt{reverse-queue! \textit{queue}} that returns \textit{queue} with its elements in reverse order. This should be done by mutating the structure so that its links are reversed. In other words, if the original queue is

\begin{center}
\begin{tikzpicture}
  \node (q) {queue};
  \node (m) [below right of=q] {Mary};
  \node (b) [below right of=m] {Bob};
  \node (a) [below right of=b] {Alice};
  \draw[->] (q) -- (m);
  \draw[->] (m) -- (b);
  \draw[->] (b) -- (a);
\end{tikzpicture}
\end{center}

then the new structure should be

\begin{center}
\begin{tikzpicture}
  \node (q) {queue};
  \node (m) [below right of=q] {Mary};
  \node (b) [below right of=m] {Bob};
  \node (a) [below right of=b] {Alice};
  \draw[->] (q) -- (a);
  \draw[->] (a) -- (b);
  \draw[->] (b) -- (m);
\end{tikzpicture}
\end{center}

For example,

\begin{verbatim}
(define q1 (make-queue))
(insert-queue! q1 'Mary)
(insert-queue! q1 'Bob)
(insert-queue! q1 'Alice)
q1

(reverse-queue! q1)
q1
\end{verbatim}

The following will be returned as the value of \texttt{q1}

\begin{verbatim}
((mary bob alice) alice)
\end{verbatim}

3. (15 points) A calculator is an object that can handle additions, subtractions, multiplications, divisions, and display. Write a procedure \texttt{Make-Calculator} that returns a “calculator object” with a specified value, and which uses the message passing style of programming for operations, where the messages are \texttt{'add}, \texttt{'subtract}, \texttt{'multiply}, and \texttt{'look-up}.

Thus, \texttt{(define X (make-calculator 0))} creates a “calculator object” \texttt{X} with an initial value of \texttt{0}.

\begin{verbatim}
((X 'add) 40) causes 40 to be added to the value of the object X.
((X 'multiply) 3) causes the value of object X to be tripled.
((X 'look-up)) causes the value of the object X to be returned.
\end{verbatim}

Use the procedures in \texttt{~carberry/HW9.scm} — but do not include them when you submit your code on the electronic submission system for Homework 9 since they will be part of the test code.